Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

John Stuart Mill, of London, was elected a Foreign Honorary Member in the Section of Political Economy and History.

Manuel J. Johnson, Director of the Radcliffe Observatory, Oxford, was elected a Foreign Honorary Member in the Section of Practical Astronomy and Geodesy.

Four hundred and thirty-fourth meeting.

January 13, 1857. — MONTHLY MEETING.

The Academy met at the house of the Hon. Robert C. Winthrop. The President in the chair.

The Corresponding Secretary read letters from Dr. George B. Wood, Dr. Isaac Hays, and Laurens P. Hickok, accepting Fellowship; from the Essex Institute, the American Antiquarian Society, the Royal Institution of Great Britain, the Society of Arts, Manufactures, and Commerce, Professor Faraday, and Sir Charles Babbage, acknowledging the receipt of the Academy's publications; from the American Oriental Society, acknowledging the same, and presenting Vol. V. No. 2 of its own Journal; and from the Société Nationale d'Agriculture, &c. de Lyon, and the Académie Nationale des Sciences, &c. de Lyon, presenting their publications.

Professor Agassiz reminded the Academy of the recent death of a distinguished associate in the following words: —

"It is the first time we meet since the death of the Hon. Francis C. Gray, one of our fellow-members. Though there are others longer acquainted with Mr. Gray than myself, who are better qualified to speak of his general merits, allow me to take this opportunity to make known to you some incidents relating to the last objects upon which his mind was seriously engaged. I have not had the happiness of knowing Mr. Gray intimately for many years; but for the last two years peculiar circumstances, which are among the most fortunate of my life, have brought me gradually nearer to him, and enabled me to become more closely acquainted with his extensive attainments, and the great powers of his vigorous and clear intellect, and to appreciate fully the kindness of his feelings, and his unbounded benevolence.

"There is hardly any field of intellectual activity which did not engage at some time or other his inquisitive mind. But among the many objects to which he has turned his attention, there is one topic which particularly deserves to be noticed on an occasion like this, when the members of the Academy must feel that they have sustained a severe loss by his departure. Taking, as was his habit in everything else, a broad view also of the events of the day, he had satisfied himself that there is no field in which young men of ability could seek for a better opportunity of doing good service to their country, than in the pursuit of science, literature, and the arts. And this subject was one to which he returned constantly in conversation for the whole past year. Early in 1856, he was invited by the Regents of the University of the State of New York to deliver an address in Albany, on the occasion of the inauguration of the Geological Hall. His sickness unfortunately prevented him from attending the celebration. The subject he had selected for the occasion was that of his constant thoughts. He hoped to make an impression upon the community by an earnest appeal to the rising generation in favor of a deeper and more thorough cultivation of the learned vocations, and especially of science. No one among us was better prepared than he to set forth the great importance and the true dignity of such pursuits. He never tired of repeating that he considered intellectual and moral culture as the object worthiest of the highest ambition. It was not, he used to say, by prowess of arms, or by wealth, that nations could in future take a high standing among civilized communities, but by their devotion to, and their appreciation of, the higher interests of science, literature, and the arts. I need not say, that with him these were not idle words. I deem it my duty, as it is my pleasure, to refer to the great exertions he made, for a number of months in succession, to render possible the publication of my Contributions to the Natural History of the United States, and I truly lament that he did not live to see at least the first volume completed. But his great heart had higher aims than the personal success of a friend. He had conceived the plan of a great institution, devoted chiefly to the study of Natural History, in its widest ramifications, which should in course of time be for this country what the British Museum and the *Jardin des Plantes* are for England and France. He spoke repeatedly of the part he would take himself in fostering such a plan, and his will bears testimony to the importance which he attached to the establishment of such an institution. When he felt his strength failing him, he lamented his inability to make an energetic appeal to his friends for such a purpose. He thought, if he could go only once more into the streets, he might effect something towards this end worthy of the country. The last time he spoke to me upon the subject, was to hint at the possibility and the means of carrying out this great plan. The emotion with which he spoke is still fresh in my memory, and will accompany me through life, as an evidence of the fervor with which a truly noble mind may be occupied with the highest interests of his fellow-men, in a moment when he feels himself already at the threshold of another world.

"I beg to offer the following resolution: —

"*Resolved*, That the American Academy of Arts and Sciences have sustained, in the death of their late Associate, the Hon. Francis C. Gray, a loss not easily to be supplied. He was a man of vigorous mind, of large and liberal culture, of generous devotion to all good and noble objects, and a true friend."

The Hon. Josiah Quincy expressed his hearty concurrence with the sentiments expressed by Professor Agassiz, and referred to his own long acquaintance with Mr. Gray, in public and private, in terms most eulogistic and friendly. In conclusion, he moved that the resolution offered by Professor Agassiz be adopted, and that a copy of it, with the prefatory remarks, be printed in the public newspapers. The motion was seconded by Professor Treadwell, and adopted unanimously.

Mr. Sherwin read a paper on a new theory of parallel lines.

Mr. Folsom laid upon the table two manuscript pamphlets, containing interesting memoranda of early meetings of the Academy, &c., which he had found among rubbish in the Athenæum. He regarded them as objects of much value, and, in conclusion, moved that they, with such other loose papers of the Academy as may be worth preserving, be suitably bound, and placed in the Library of the Academy, and that a committee of four be appointed to attend to the matter. It was voted accordingly, that Messrs. Folsom, Bowen, Felton, and the Librarian be a committee for this purpose.

Professor Horsford read the following paper, "On the Oleic Acid Series of Fatty Acids," by George C. Caldwell, B. S., Ph. D.

"The fatty acids obtained from the various animal and vegetable fats that occur in nature, it is known, are divided into two principal classes.

"The one class forms a part of the series of acids constituted according to the formula $C_n H_n O_4$, while the other class forms the series with the formula $C_n H_{n-2} O_4$. The former series is by far the more completely developed, there failing but a few members, from formic acid, $C_2 H_2 O_4$, up to arachinic acid, $C_{40} H_{40} O_4$. As we pass from one acid to another in this series, there is a gradual change in the properties of successive acids, corresponding to the change in the formula, — a change which is exhibited more especially in the boiling point of those acids which can be distilled undecomposed, or in the melting points of those that cannot be.

"The other series is much less extensive, only the following members being yet known: —

Brassinic acid	$C_{45} H_{43} O_4$
Erucaic acid	$C_{44} H_{42} O_4$
Döglingic acid	$C_{38} H_{36} O_4$
Oleic acid	$C_{36} H_{34} O_4$
Hypogæic acid	$C_{32} H_{30} O_4$
Moringaic acid	$C_{30} H_{28} O_4$

"Also, in this series we observe none of that perfect correspondence between the formulæ and properties of different acids in relation to one another.

"This latter series being at the present time rendered an object of more special interest by the discovery of a new member, we give here a short account of the series in general, in connection with the result of investigations on this new member, which its discoverer, Dr. A. Goessmann, afforded us an opportunity of making, in the laboratory of Professor Wöhler in Göttingen.

"The oleic acid, the principal and best-known member of this series, was discovered by Chevreul, and its characters were subsequently completely developed by Gottleib. It is a solid fat at low temperatures, but melts at 16° C., and then oxidizes very readily in the air, thereby becoming changed to a reddish-yellow oil. Two very characteristic properties of this acid are as follows: —

"First. Under the influence of nitrous acid gas, it is transformed into an isomeric modification, not oxidizable in the air, and possessing a higher melting point than the oleic acid itself.

" Second. On dry distillation, it yields sebacic acid, among many other products.

" These properties being so characteristic and peculiar as they are, we might expect to find them with other members of the series ; but the sequel will show that such is the case only in part.

" The oleic acid is very widely diffused, forming, as it does, a constituent of all the more important animal fats, and of most of the vegetable fatty oils. In a few cases only is it replaced by other acids constituted according to the same general formula.

" The *döglingic acid*, $C_{38} H_{36} O_4$, was discovered in a fat obtained from a species of dolphin. This acid is likewise solid only at low temperatures. Under the influence of nitrous acid, it undergoes a change ; but whether an isomeric acid is produced is not yet known. Neither has it been determined whether it yields sebacic acid on dry distillation.

" The *brassinic acid* is found in the rape-seed oil. It melts at 32 – 33° C., is changed in the air when heated to 100° C., and is very soluble in alcohol, as are all the members of this series. An isomeric modification results from the action of nitrous acid.

" The *erucaic acid*, $C_{44} H_{42} O_4$, is found in the fatty part of the white mustard. It melts at 34°, and is very soluble in alcohol. Farther than this, we know nothing concerning its properties.

" The *moringaic acid* was found in the poppy oil. It has been but little studied.

" Finally, the hypogæic acid, which has formed the subject of our investigation, is a constituent of the oil obtained from the fruit of the African plant, the Arachis hypogæa, which is known in commerce as the ground-nut or pea-nut.

" To obtain it, the lead salt is first prepared from the crude mixture of the acids which occur in the oil, according to the ordinary method of preparing oleate of lead. This lead salt, on decomposition with a mineral acid, yields a reddish-yellow mass, which, at common winter temperatures, is a mixture of a reddish-yellow oil, and a white crystalline substance ; the latter is the pure acid, the former the product of oxidation by the air. From this mixture the pure acid can be obtained by combining the whole with baryta, repeated recrystallization of the product from an alcoholic solution, and decomposition of this pure salt with a mineral acid. Thus purified, the hypogæic acid forms a white solid fat, which melts at 34° C., and then readily oxidizes in the air, precisely as is the case with oleic acid. The hypogæic ether, and the copper and baryta salts possess the same properties as the corresponding compounds of oleic acid.

" In order to determine the result of the action of nitrous acid on this acid, we instituted the following experiments.

" A portion of the acid, partly oxidized by the air, was slightly warmed to render it completely fluid, while a rapid current of nitrous acid gas was conducted through the liquid. The product, after being allowed to stand a week in a well-closed vessel, yielded, on recrystallization several times repeated, an acid which melted at 37 – 38° C., was unchangeable in the air, and very soluble in alcohol, separating from the solution in a crystalline form.

On analysis, the following results were obtained : —

	Calculated.		Found.	
C_{32}	75.59	75.41	75.57	75.59
H_{30}	11.81	12.01	11.91	11.89
O_4	12.60			

" Hence this acid is an isomeric modification of the hypogæic acid ; we have proposed for it the name of Gæidinic acid.

" *Gæidinic ether* is a colorless oil, soluble in alcohol and ether, which solidifies at low temperatures, and can be distilled without decomposition.

" *Gæidinate of potassa* is easily soluble in water and alcohol, and can be obtained in pearly crystalline scales.

" *Gæidinate of baryta* is a white powder, insoluble in water, more soluble in alcohol.

" *Gæidinate of copper* is a green powder, with difficulty soluble in water or alcohol, which melts before decomposition.

" *Gæidinate of silver* is a flocky precipitate, insoluble in alcohol or water, soluble in ammonia, and which is readily blackened on exposure to the light.

" On comparison of this new acid with elaidic acid, the product of the action of nitrous acid on oleic acid, we find a perfect correspondence in their properties, and also that the relation between the properties of hypogæic and gæidinic acids on the one hand, and oleic and elaidic acids on the other, is quite similar.

" The oleic and hypogæic acids are both, as we have seen, readily oxidized on exposure to the air, as are also the ether compounds; and farther, neither the acids themselves, nor their ether compounds, can be distilled without decomposition.

" On the other hand, the elaidic and gæidinic acids are both unchangeable in the air, as well as their ether compounds. And they and their ether compounds can be distilled without undergoing decomposition. These acids also possess higher melting-points respectively than the oleic and hypogæic acids, although we observe here the remarkable distinction, that, while accompanying the transformation of oleic acid into elaidic acid there is an elevation of 31° C. in the melting-point, the same transformation of hypogæic into gæidinic acid produces a change of but 4° C. in the melting-point.

" The correspondence between the gæidinic and elaidic acids is also further established by the relation between their melting-points. They differ by $C_4 H_4$ in constitution, and their melting-points differ by about seven degrees. As Heintz has shown in regard to the other series of fatty acids, a difference of from 7° – 10° C. in the melting-points corresponds to a difference of $C_4 H_4$ in constitution; this rule holds good within certain limits so far as the melting-points have been accurately determined.

" These results, then, show that, under the influence of nitrous acid, hypogæic acid behaves in a manner precisely similar to that which characterizes oleic acid under the same circumstances.

" Farther, as the results of our investigation have proved, sebacic acid is one of the products of the dry distillation of hypogæic acid. Thus, that correspondence between the characteristic properties of these two acids which we should have a right to expect with two bodies standing near to one another in the same series, does not fail to hold good in every important respect. And this result is interesting, as no other member of this series of acids which has yet been discovered has yielded such satisfactory results.

" It is to be hoped, that further investigation on this series may develop a more complete correspondence between its members; for, as they now stand, there is hardly sufficient resemblance in their properties alone to suggest a classification of all of them together. The principal reason for this classification being founded in their constitution alone."

Professor Agassiz said, that, in the course of his recent studies of the Turtles, he had been anxious to ascertain whether the different stages of embryonic development, and the different orders of this class, corresponded with the different stages of geological succession. He was satisfied that the tracks in the Potsdam Sandstone and the Trias, attributed to these animals, were not made by them. The earliest remains of Turtles were found in the Jura, and they are of the fresh-water type. Now the order of position among Turtles places marine types lowest, next fresh-water, and last land Turtles. There was a want of correspondence with the geological succession. From the descriptions of these specimens, and his own recollection of them, however, Professor Agassiz was satisfied that these fossils present a synthetic type, like the Crinoids among the Radiata; showing characteristics belonging to several types. A similar instance he had found among the living species of South American Turtles, from Brazil, the Podœnemyds; which, although belonging to the fresh-water type, yet present certain characters in the formation of the temporal region very similar to those of marine species, constituting a true synthetic type. Professor Owen obtained from the Chalk the next geological species which had been discovered, and they belong to the Chelmians, with some characters of the marine species, but not the general form, — another synthetic type. Professor Agassiz did not regard these forms as presenting true exceptions to the law of correspondence between geological succession and the grade of development in living species, but only as evidence of the existence in past ages, as well as the present, of what he had called *synthetic types.*

Professor Horsford announced a new and convenient method of determining the value of saltpetre for the manufacture of nitric acid, by ignition with sal ammoniac.

Four hundred and thirty-fifth meeting.

January 28th, 1857. — STATED MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read a letter from Manuel J. Johnson, of the Radcliffe Observatory, Oxford, accepting his election as Foreign Honorary Member.